PORTLAND HARBOR RI/FS

FIELD SAMPLING PLAN
STORMWATER SAMPLING

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1.0 INTRODUCTION

This stormwater Field Sampling Plan (FSP) presents the approach and procedures to implement stormwater sampling activities in early 2007 for the Remedial Investigation/Feasibility Study (RI/FS) of the Portland Harbor Superfund Site (Site). This FSP describes the field sampling and laboratory analysis procedures to accomplish the following types of data collection:

- stormwater chemistry, Total Suspended Solids (TSS), and associated conventionals;
- stormwater sediment chemistry and associated conventionals; and
- stormwater runoff volumes.

The field study approach, sampling methods, and analyses for stormwater sampling are described in this document. The stormwater investigation approach presented here is based on the December 13, 2006 memorandum (Koch et al. 2006) from the U.S. Environmental Protection Agency (EPA) assigned stormwater technical team for the RI/FS as well as notes from a Portland Harbor managers meeting where the memorandum was discussed on December 20, 2006. The technical team included ~~members of~~representatives from EPA, Oregon Department of Environmental Quality (DEQ), and the Lower Willamette Group (LWG).

The purpose of this sampling and analysis effort is to provide data for evaluating the potential risk and sediment recontamination threat from stormwater discharges to the river. These data will be used for understanding the magnitude of stormwater impacts to the harbor, developing the draft in-river Site RI, identifying stormwater data gaps, and eventually, for evaluating remedial alternatives in the Site FS.

Several estimation and evaluation tools will be used in these assessments. ~~The data needs of these tools were considered to help define the type and quantities of data to be collected.~~ The modeling tool of primary consideration is EPA's Fate and Transport Model described by Hope (2006). This tool is being used by DEQ to help identify and prioritize the stormwater sources that may require~~and needed~~ source control measures. It is also being used by EPA/LWG in combination with the LWG-developed in-river Hydrodynamic and Sedimentation Model (West 2005) to directly evaluate the RI/FS objectives discussed in the next subsection. In summary, these models require ~~data~~ estimates of the~~input in terms of~~ chemical mass load (e.g., kg/yr) ~~for~~from each type of contaminant source (e.g., stormwater, groundwater, upstream, etc.) ~~estimated~~ for each of the~~along~~ model-defined segments of the river. ~~For stormwater, a chemical mass "load" per unit time (e.g., kg/yr) is needed for each river segment of the model.~~

In general, to estimate stormwater loads, a chemical concentration in stormwater and the volume of stormwater discharge (i.e., flows) must be known. These terms ~~in the loading equation~~ can be either directly measured (the subject of this FSP) or estimated through indirect means (e.g., runoff modeling of stormwater volumes). Because of the large number of outfalls present at the Site, it was determined by the technical team that sampling of every outfall was infeasible to calculate the needed Site-wide stormwater chemical loads. Consequently, a subset of outfalls, as described in more detail below, will be sampled for stormwater chemistry and flows. The data from this subset of outfalls will be used to extrapolate loading to other outfalls and/or model segments. Mostly, sampling sites were selected to be representative of particular kinds of land uses. For example, stormwater chemical concentrations measured from residential land use areas will be applied to other unsampled residential land use areas and converted to extrapolated loads based on the estimated volumes of stormwater discharged from those unsampled areas. The resulting series of extrapolations will provide total stormwater loads for the entire Site that can be input into the fate and transport model and other estimation tools. The exact methodology for extrapolating chemical and/or flows data to unsampled outfalls or model segments for RI/FS purposes is the subject of ongoing discussions between EPA, DEQ, and the LWG.

1.1 STORMWATER SAMPLING OBJECTIVES

The objectives of the stormwater sampling program were developed in coordination with EPA, DEQ, and the LWG. These objectives are defined as:

- EPA/LWG RI/FS Objectives
  1. Understand stormwater contribution to in-river fish tissue chemical burdens.
  2. Determine the potential for recontamination of sediment (after cleanup) from stormwater inputs.
- DEQ/City of Portland Source Control Objectives
  1. Evaluate stormwater discharges to identify potentially significant hazardous substances that could reach the river.~~Determine stormwater sources that now contribute (or could in the future) unacceptably to risks in the river (in terms of direct water or sediment toxicity or bioaccumulation).~~
  ~~2.Identify and control sources and estimate stormwater contributions to in-river risk after controls.~~
  2. Identify, prioritize and control stormwater sources as necessary to prevent contamination of Willamette River water and sediments and recontamination of river sediments following the Portland Harbor cleanup.

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The primary focus of this FSP is to obtain data that meet RI/FS objectives, and the technical team devised a sampling framework with this intent. However, the team also considered techniques and approaches that could feasibly provide potential overlapping data uses to help meet Source Control Objectives.

It should be noted that in addition to the stormwater data collection described in this FSP, DEQ is pursuing collection of stormwater data at a number of Portland Harbor sites as a part of the Joint Source Control Strategy (JSCS) to meet the above source control objective. The City of Portland is also collecting some stormwater data for various purposes related to stormwater source control. As these data become available, they will be used wherever possible and technically defensible to augment the estimations of stormwater loads based on data collected as described in this FSP to help meet the above RI/FS objectives.

The RI/FS objectives as they relate to this FSP are discussed in more detail below.

1.1.1 Stormwater Contribution to Fish Tissue Burdens

Surface water chemicals are contributing to fish tissue burdens (and related risks) in the harbor. The importance of various sources of surface water chemicals, particularly stormwater, is not well understood. This lack of understanding could make it difficult to accurately determine sediment (and water) PRGs that are intended to minimize fish tissue related risks for the site.

Thus, it is necessary to determine the relative contribution of stormwater (as compared to other sources) to surface water concentrations of selected chemicals. As noted above, this would be done for stormwater in terms of loading estimates. Thus, to understand stormwater's contribution to fish tissue burdens, similar data needs exist for other sources and are addressed elsewhere in RI/FS planning and reporting documents.

1.1.2 Stormwater Contribution to Recontamination Potential ~~Evaluation~~

~~Surface water chemicals may~~Stormwater discharges have the potential to contribute to recontamination of ~~remediated~~ sediment near outfalls (and/or potentially widespread for some chemicals) after cleanup has been completed if the discharges contain contaminants attached to settleable solids. The potential for this outcome must be assessed at an FS appropriate level of detail to understand the general extent and need for stormwater source controls at least on a regional basis within the site.

To predict whether sediments would recontaminate at levels above PRGs eventually set for the ~~s~~Site, estimates of stormwater loads by outfall, or at least by area of concern/sediment management area, ~~(or at least region)~~ are needed. This requires estimates of loads by modeling segment (as described by Hope 2006) of the river. Estimates of the mass of chemicals present in particulate forms to support Fate and Transport modeling predictions of inputs to and eventual concentrations of chemicals in sediments are also needed.

1.2 STORMWATER SAMPLING APPROACH

This FSP describes the approach for measuring the concentration of contaminants in stormwater~~sampling stormwater chemical concentrations~~ and for obtaining stormwater

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flow data at 31 select locations in the Site. This data will be used, in conjunction with estimation and evaluation tools, to estimate the nature and extent of contaminant loading from stormwater discharges into the Site. ~~for directly estimating stormwater loads and extrapolation of loads to other unsampled outfalls or modeled river segments.~~ In summary, the sampling approach involves~~at each of these select outfalls determined by the technical team is~~:

1. Flow-weighted composite water samples from three storm events including whole water for organic compound analyses and filtered/unfiltered pairs for metals analyses.

2. Additional grab stormwater samples at 10 of the 31 for sampling of filtered/unfiltered pairs and analysis of selected organic compounds.

3. Sediment trap deployment and sampling for a minimum of three months

4. Continuous flow monitoring at each sampling site for the duration of the sediment trap deployment period

The rationale for this sampling approach to meet RI/FS objectives and details of each element of the approach is described in more detail in the remainder of this document.

1.3 DOCUMENT ORGANIZATION

The remaining sections of this document describe the sampling plan and field procedures that will be used to collect stormwater and sediment samples:

- Section 2 describes the sampling design and rationale.
- Section 3 summarizes stormwater sample collection, processing, and measurement procedures for stormwater samples, sediment samples, and stormwater flows.
- Section 4 describes the sampling implementation and schedule including contingency procedures that may be employed to collect data.
- Section 5 summarizes how the data will be reported.
- Section 6 provides references.

Detailed standard operating procedures (SOPs) for sampling and flow measurements are provided in appendices. The appendices also contain a Chain of Custody SOP, field sampling forms, and health and safety procedures and are organized as follows:

- Appendix A Stormwater Composite Sampling SOP

- Appendix B Stormwater Grab Sampling SOP
- Appendix C-1 Sediment Trap Sampling SOP
- Appendix C-2 Stormwater Filtering for Sediment Collection (Back Up Procedure)
- Appendix D Flow Meter Measurements
- Appendix E Field Forms
- Appendix F Chain of Custody SOP
- Appendix G Laboratory Protocol for Extraction and Analysis of Large Volume Water Samples
- Appendix H QAPP Addendum
- Appendix I Health and Safety Plan

2.0 SAMPLING DESIGN AND RATIONALE

This section describes rationale for the stormwater sampling design that will support the RI/FS objectives.

2.1 DATA NEEDS

Existing stormwater quality data for the Site are sporadic and relatively limited (Integral et al. 2004). Consequently, estimation of stormwater loads to the river based on existing data or literature values would be ~~difficult and~~ highly uncertain. Site-specific stormwater sampling is needed to support stormwater chemical loading estimates for input into the fate and transport model and other estimation tools that will be used to assess the two RI/FS objectives as noted in Section 1.

NOTE: When using data generated from this sampling plan for modeling or other estimation tools, it is important to bear in mind its limitations. Both the small number of storm events sampled (3) and the limited timeframe for collecting samples (~ February through May of a single water year) need to be considered when extrapolating from this data to estimate average annual contaminant loads to the river.

2.1.1 Sampling Locations

As noted in Section 1, it is infeasible to directly measure all outfalls at the Site. Consequently, it was decided that a three-pronged approach would be used to balance the need for good stormwater data with the feasibility and cost of collecting it.

The foundation of the sampling plan would be to sample a ~~some~~ subset of outfalls ~~should be sampled~~ and use information from those outfalls ~~must be~~to extrapolate~~d~~ to other outfalls or areas draining similar land uses~~with similar conditions.~~ This is a commonly used and accepted approach in the field of stormwater management~~The primary method typically used in such extrapolations is based on descriptions of land use types draining the areas in question~~ (Schueler 1987). ~~Thus, the land use characteristics of the overall drainage basin for the Site should be described and to the extent possible sampling locations that isolate and measure runoff from specific types of land uses should be selected. In general, the greater the proportion of each land use within the overall drainage basin, the greater the proportion of sampling locations that should be assigned to that land use.~~ The primary land uses within the overall Site drainage basin, in descending order are: parks/open space (e.g., Forest Park), industrial, and residential. The remainder of the drainage areas is composed of mixed uses (e.g., combinations of residential and commercial), major transportation corridors (e.g., Highway 30 and Interstate), and commercial (e.g., shopping areas).

The sampling plan also includes outfalls at a number of individual industrial sites where it may not be appropriate to use "representative" land use loading rates because those sites could be expected to have significantly higher or unique contaminant loads.

~~Another primary issue that should be considered when selecting sampling locations is that industrial land uses tend to be relatively highly polluting and can have relatively unique chemical characteristics depending on the particular industrial activities taking place. Thus, extrapolation of generalized "industrial" loading rates to specific industrial sites may be highly uncertain and could greatly under or overestimate the actual loading from a particular industrial site.~~ For example, extrapolation of PAH loads from general industrial storage type facilities to a former Manufactured Gas Plant site, would be problematic. ~~Thus, some sampling of specific and/or unique conditions associated with particular industrial activities within the overall Site drainage areas is also warranted.~~

Finally, the sampling plan includes a small number municipal outfalls that drain relatively sizeable, mixed use drainage basins. This data directly measures the combined load from all sites within that shared conveyance system and eliminates the need to use extrapolated loading rates for these areas. When feasible, d~~because the overall purpose of the sampling is to calculate loads for the site, it is important to optimize sampling locations to minimize the amount of extrapolation based on land use. Although all outfalls cannot be directly sampled, the number of outfalls that need to be extrapolated from indirect information should be minimized where possible, in favor of directly measuring loads. That is, d~~irectly measured data is preferred over extrapolated data, and it is generally most cost effective to select outfalls that drain larger rather than smaller basins.~~, when a feasible choice can be made. Consequently, preference should be given to sampling locations as close to the outfall discharge point as possible, while taking into account any physical limitations, and maintaining the approach of isolating certain land uses within a reasonable subset of the sampling locations. Similarly, where one location at or near a large basin's discharge point can be sampled, this would be preferred to extrapolating loads based on land use from many other sampling points outside the basin. The smaller the basin, the less feasible this preference becomes unless the number of sampling locations is to become very large. Consequently, application of this preference should be reserved for basins that represent at least several percent of the overall drainage basin for the site.~~

2.1.2 Sampling ~~Types~~Approach

Sampled stormwater chemical concentrations in urban areas are known to be highly variable and depend upon:

- the specific chemical sources within the drainage basin, which may vary over time and location within the basin
- the characteristics of the storms and their associated runoff (i.e., antecedent dry periods; storm amounts, intensity, and durations; stormwater collection system characteristics; and presence, condition and proper functioning of source controls)
- how and where stormwater is sampled

- when in the storm the samples are collected (i.e., first flush, rising limb, falling limb etc.)

Ideally, estimation of long-term loads (as are needed for this project) would involve a large number of samples over the course of many years and many types of storm, pollutant source, and runoff conditions. However, such an approach is rarely acceptable in terms of schedule or budget and is infeasible for this project. Consequently, methods that integrate, average, or estimate long term chemical concentrations and flows over time are preferred. ~~Similarly, multiple methods that allow this integration in various ways, and thus a comparative analysis of the potential range of long term loads, are preferred over any one single method of load estimation.~~

This sampling plan will produce data that allows for two different ways to estimate mass loading from stormwater sites.

- Composite stormwater samples from three storm events will be analyzed to determine the Event Mean Concentration (EMC) of a number of analytes. The EMC values will be multiplied by runoff volume to calculate mass loading.
- Sediment trap samples will be analyzed to obtain contaminant concentrations, which will then be used in conjunction with TSS data from the water samples and runoff volume to calculate mass loading associated with particulates.

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It is anticipated that these two methods will result in different predictions of mass loading at most sites. This will allow for a comparative analysis of the potential range of loading rates.

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~~Each measurement method selected should be fully evaluated to understand any types of supporting information that are needed to allow calculation of a long-term load. One important supporting measurement will be TSS data in water samples. These TSS data will be needed to calculate chemical concentrations in water from sediment trap data. In this calculation, TSS (mass sediment/volume water) is multiplied by sediment trap chemical concentrations (chemical mass/mass sediment) to obtain a concentration in water (chemical mass/volume water). This water concentration can then be multiplied by the volume of water discharged over some period to obtain a mass load exactly like calculations based on direct measurements of water chemical concentrations.~~

~~In addition, information on grain sizes in sediment traps would be useful in understanding the potential for particulate associated stormwater pollutants to settle and recontaminate sediment near outfalls. However, these data cannot be collected in preference to chemical concentrations without jeopardizing the ability to analyze all chemicals of interest, due to expected sediment sample volume limitations. Because of these logistical considerations, grain size data will likely be obtained for only a subset of sediment samples collected.~~

The sampling plan will also generate data needed to ~~Also, the assumptions and calculation methods behind modeling tools that the data will be input to should be fully understood and evaluated to ensure that any ancillary data needed for these tools is collected. One particular data need of this type that has been identified is collection of filtered and unfiltered stormwater samples to~~ help validate the partitioning algorithms used in the fate and transport model and other estimation tools. Stormwater samples from all sites will be analyzed for both total and dissolved metals (i.e., analysis of both filtered and unfiltered samples) to evaluate partitioning. This is necessary ~~Such samples will be collected at all sampling locations and analyzed for metals on the analyte list,~~ because site-specific metals partitioning is difficult to predict based on literature information. In addition, ~~limited~~ grab samples~~ing~~ of filtered/unfiltered water will be conducted at a subset of sampling locations and analyzed for organic compounds to provide some information on the range of partitioning characteristics for these chemicals. The partitioning of organic compounds is generally more predictable based on literature information, but some limited data collection for organic compounds will help validate these predictions.

Information on grain sizes in sediment traps would be useful in understanding the potential for particulate associated stormwater pollutants to settle and recontaminate sediment near outfalls. However, these data cannot be collected in preference to chemical concentrations without jeopardizing the ability to analyze all chemicals of interest, due to expected sediment sample volume limitations. Because of these logistical considerations, grain size data will likely be obtained for only a subset of sediment samples collected.

2.2 SAMPLING LOCATIONS

Based on the data needs, the sampling locations in Table 2-1 were selected and are shown in Figure 2-1. The locations are broken down into several categories in Table 2-1 that reflect the data needs discussed above and the negotiation process of the Technical Team:

- Industrial locations (12) that may have unique chemical loads
- ~~Land Use-Based and General Urban locations (12)~~
- Locations targeting specific isolated land uses (9)
- Locations targeting large basins with mixed urban uses (3)
- T-4 Recontamination Study locations (7) representing a range of sites that represent both land use-based and relatively unique industrial sites.

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With respect to data needs, the "land use based" outfalls are generally those that are targeting particular types of land uses and data from these sites will be used to extrapolate to other unsampled areas. Locations at outfalls OF17, OF19, and M-1 represent large basins with relatively mixed land uses and will likely not be used in extrapolations of land use based loading rates, but rather represent a direct measurement of a substantial portion of the overall drainage basin to the Site.

The Industrial sites reflect those locations that generally fulfill data needs for sampling of specific or unique industrial activities and mostly fall into the land use category of "heavy industrial". In some cases, chemical signatures from these locations will not be specific to the activities at the site, and these data may be useable for extrapolation to a generalized heavy industrial loading rate for some chemicals. For example, PAH concentrations at the Schnitzer location(s) may be representative of general heavy industrial conditions, while the metals concentrations are likely not. Thus, the Industrial category sites should not be viewed as exclusively useful only to directly measure concentrations from these particular sites and may have wider application to the study.

Finally, there are seven locations identified associated with the Port's T-4 sampling effort, which is ongoing. The Port has agreed to adapt this program to follow the approach defined in this FSP. Data from these locations will be used similar to that described above for "land use based" locations using the categories identified in Table 2-1. However, the data will be evaluated to determine if any of these locations exhibit unique or particular chemical signatures related to specific industrial activities on these sites. If so, data from these locations may be more properly evaluated similar to the high priority sites, where only some locations or chemicals are used in the land use based extrapolations to Site wide loads.

2.3 SAMPLE TYPES AND NUMBERS

Table 2-2 summarizes the proposed stormwater sampling types, numbers, and analyses. Table 2-3 summarizes the priority order of sampling of analytes for each sample type and the approximate sample volumes that will be needed for these analyses. The analytical concentration goals achievable with these sample volumes is discussed more below. Three types of measurements will be conducted at each station:

Stormwater Composite Samples. Flow-weighted composite samples of 3 storm events from each location will be collected to obtain Event Mean Concentrations (EMCs) of COIs. Flow-weighted, whole water (unfiltered) samples will be collected with ISCO Model 6712 automatic samplers. These whole water samples will be collected by the sampling teams, identified in Section 4, and transported to the LWG Field Laboratory. At the LWG Field Laboratory these samples will be composited; the water from the individual sample bottles will be combined and mixed in a single container. Whole water samples for organic compounds, and unfiltered/filtered water pairs will be prepared for metals and TOC/DOC by the sampling teams from the combined composite sample. Samples will also be prepared for analysis of TSS concentrations. Each sample will be analyzed for the chemicals shown in Tables 2-2 and 2-3. In addition, organochlorine pesticides will be analyzed in composite water samples at the following sites given their potential source histories:

- WR-96 – Arkema
- WR-22B – Front Ave. Props.
- WR-6 – Rhone-Poulenc

Only a subset of sites will be analyzed for phthalates because of the logistical difficulties of avoiding phthalate contamination from field sampling equipment. Through Technical Team discussions, it was determined that it was appropriate to analyze for phthalates at those locations where there was a reasonable potential for phthalate related in-river risks that might be linked to upland sources. In addition, as a cross check on the assumptions behind potential phthalate sources, analyses should also be conducted for some locations that were not known or suspected phthalate sources. The preliminary risk evaluations currently underway by the LWG were reviewed for potential phthalate related risks near any of the proposed stormwater sampling locations. The following 7 potential phthalate source locations were identified and are recommended for phthalate analyses:

- WR-24 – Oregon Steel Mills
- WR-121/123 – Schnitzer
- WR-96 – Arkema
- OF-M1 – Swan Island Lagoon
- WR-145 – Gunderson
- WR-148 – Gunderson (former Schnitzer)
- OF-M2 – Swan Island Lagoon

In addition, the following 5 locations represent a cross-section of land uses that are not known or suspected phthalate sources and should also be analyzed for phthalates:

- WR-161 – Portland Shipyard (Heavy Industrial)
- OF-17 – City Mixed Use Basin
- OF12a – Freemont Bridge - To Be Determined (Transportation)
- OF-49 – City Residential Basin
- OF-22c – Forest Park (Open Land Use)

Also, phthalate analyses will take place at some T-4 locations to be determined in consultation with the Port. This results in a total of 12 locations known at this time that will receive phthalate analyses.

The target storm conditions for sampling are: storms predicted to produce >0.2 inches rainfall over a minimum of a 3 hour period, not exceed 1.25 inches in a 24 hour period, and have been preceded by at least a 24 hour dry period (< 0.1 inches rainfall). The objective is to get a sample that represents the entire storm hydrograph. However, the sampling period will be cut off when the sample bottles are full and thus in some cases, the falling limb of the storm hydrograph may not be sampled in its entirety.

Stormwater Grab Samples. Stormwater discrete “grab” samples will be collected from 10 locations where it is most likely that organics would be detected in water samples and analyze the samples for total and dissolved organic constituents. The sampling locations were reviewed based on general knowledge of site uses and potential sources. The following list of locations, spanning the likely primary chemicals of concern for the harbor, was determined for this sampling:

- WR-24 – Oregon Steel Mills (PCBs/phthalates)
- WR-121/123 – Schnitzer (PCBs/phthalates)
- WR-96 – Arkema (DDx/phthalates)
- WR-107 – Gasco (PAHs)
- WR-145 – Gunderson (PCBs/PAHs/phthalates)
- OF-12a – Freemont Bridge (PAHs)
- OF-17 – Mixed Use (PCBs/PAHs)
- WR-22B – Front Ave. Props. (Pesticides, various)
- WR-6 – Rhone-Poulenc (Herbicides/Pesticides/PCBs)
- OF-22 – Willbridge (PAHs).

Also, similar grab sampling may take place at some T-4 sites as determined in coordination with the Port. In addition, four of these sites are on the potential phthalates list for composite sampling, and thus, will be analyzed for phthalates. Other locations will not be analyzed for phthalates in grab samples.

The sample teams will collect the required quantity of water and transport it to the LWG Field Laboratory, where one aliquot will be filtered and distributed appropriately to bottles for laboratory analyses and a second aliquot will be distributed directly to bottles. Each sample will be analyzed for the organic compounds shown in Table 2-2 and TSS. Additionally, organochlorine pesticides will be analyzed at Arkema, Front Ave., and Rhone-Poulenc. Because filtering methods (e.g., filter matrix) differ between organic compounds and metals, metals will not be filtered and analyzed for these grab samples. Storm conditions for grab sampling are the same as for composite sampling described above, with grab samples taken sometime in the course of the hydrograph of a continuous storm meeting the above requirements.

Sediment Samples. Sediment traps will be installed in within catch basins, junctions, or pipes immediately upstream of the outfall discharge. Figure 2-2 presents a photograph of a prototype of the sediment trap that will be deployed. The sediment trap will be placed adjacent to the outlet of the stromwater facility with the opening of the collection bottle at the same elevation as the invert of the outlet. These sediment traps will be deployed at each location for a minimum target period of three months. Sediment traps will be inspected at a minimum on a monthly basis. When inspected, if the collection bottle more than half full of sediments the bottle will be collected and archived and an empty collection bottle will be returned to the trap. If the collection bottle is less than one third full at the first monthly inspection, options for repositioning or relocating the equipment to obtain better collection rate will be considered.

Sediments will be collected and archived until sufficient volume of sediment (as shown in Table 2-3) is available for the entire suite of analytes shown in Tables 2-2 and 2-3. If this occurs prior to completion of the 3-month deployment period, collection will continue for a second sample until the three month duration is completed.

In Table 2-3 analytes are ranked in priority order in the event that any collected sample size is insufficient to run all analyses. Given that some industrial sites are not known or suspected sources of organochlorine pesticides but are potential sources for PAHs and phthalates the priority order of these two chemical classes will be reversed for the following locations:

- WR-24 – Oregon Steel Mills
- WR-121/123 – Schnitzer
- WR-109 – Schnitzer Riverside
- WR-107 – Gasco
- WR-14 – Chevron
- WR-161 – Portland Shipyard
- WR-1/5 – Sulzer Pump
- WR-145 – Gunderson
- WR-148 – Gunderson (former Schnitzer)

Grain size is the last priority analyte. As discussed above, it is unlikely that large enough samples for grain size analysis will be obtained at most locations. Thus, it is unlikely that more than one sediment sample will be obtained from each location.

Also, due to physical constraints, it may be impossible to deploy sediment traps at some locations. Contingency procedures in the event of this problem are discussed more in Section 4.3. One possible contingency measure is to pump and actively filter sediments from stormwater at some sites. Thus, this back up technique is also described in Section 3.5.2.

Flow Measurements. ISCO Model 750 Area Velocity flow modules will be used in conjunction with the ISCO automatic samplers to allow the collection of flow-weighted composites at each sampling location. The flow modules will also continuously record flow data for the duration of sediment trap deployment. This will allow accurate assessment of the total volume discharged during the period of sediment trap deployment.

All sampling equipment will be deployed at locations that are as close to the point of discharge (for outfall locations) or the last junction associated with the land area of interest (for the land use based locations). In all cases, equipment will be placed at elevations sufficient to minimize the potential for river water to back up to the sample location and compromise the collection of true stormwater samples.

2.4 SAMPLE ANALYSIS

Stormwater and sediment samples will be analyzed as described below. Table 2-4 summarizes the analytes and methods of analysis for each analyte group for each sample type (sediment and stormwater).

2.4.1 Water Samples

The stormwater samples will be analyzed for pH, conductivity, turbidity, dissolved oxygen, and temperature in the field. Stormwater samples will be analyzed at selected chemical laboratories for conventionals, metals, and organic parameters as summarized on Table 2-4. It is anticipated that sufficient sample volume (as noted in Table 2-3) will be collected during each stormwater event to conduct all analyses listed in Table 2-4. The specific analytes for each parameter group and the analyte concentration goals (ACGs) are included on Table 2-5. Table 2-1 shows the number of natural samples and identifies the QA/QC samples for each sampling event. A QAPP Addendum for the Round 2A QAPP (Integral and Windward 2004) for this investigation is presented in Appendix H. The QAPP Addendum summarizes the analytical program and provides details on the laboratory methods, QA procedures, and QA/QC requirements.

2.4.2 Sediment Samples

The sediment samples will be analyzed at selected chemical laboratories for conventionals, metals, and organic parameters as summarized on Table 2-4. The analytes are listed in the priority for analysis in Table 2-3. If sufficient mass (as shown on Table 2-3) is not available to complete all analyses, the analyses will be conducted by the laboratory in the priority order identified in this table. Any additional mass available, will be used for laboratory quality control analyses (matrix spike samples, laboratory duplicate samples, matrix spike duplicate samples). The specific analytes for each parameter group and the analyte concentration goals (ACGs) are included on Table 2-5. Table 2-2 shows the number of natural samples and identifies the QA/QC samples for each sampling event. A QAPP Addendum for the Round 2A QAPP (Integral and Windward 2004) for this investigation is presented in Appendix H. The QAPP Addendum summarizes the analytical program and provides details on the laboratory methods, QA procedures, and QA/QC requirements.

3.0 SAMPLE COLLECTION AND PROCESSING PROCEDURES

The following sections describe the detailed sampling procedures, record keeping, sample handling, storage, and field quality control procedures that will be used during stormwater and sediment sampling.

3.1 FIELD LOGBOOK AND FORMS

All field activities and observations will be noted in a field logbook during fieldwork. The field logbook will be a bound document containing individual field and sample log forms. Information will include personnel, date, time, station designation, sampler, types of samples collected, and general observations. Any changes that occur at the site (e.g., personnel, responsibilities, deviations from the FSP) and the reasons for these changes will be documented in the field logbook. Logbook entries will be clearly written with enough detail so that participants can reconstruct events later, if necessary.

A sample collection checklist will be completed following sampling operations at each station. The checklist will include station designations, types of samples to be collected, and whether field replicates/duplicates, rinsate blanks, or additional sample volumes for laboratory QC analyses are to be collected. A set of field log forms is included in Appendix E

3.2 EQUIPMENT AND SUPPLIES

Equipment and supplies will include sampling equipment, utensils, decontamination supplies, sample containers, coolers, logbooks and forms, personal protection equipment, and personal gear. Protective wear (e.g., gloves, steel toed boots) will be worn by field personnel as specified in the HSP (Appendix I).

A detailed list of sampling equipment and supplies are listed in SOP Appendices as follows:

- Stormwater composite sampling – Appendix A
- Stormwater grab sampling – Appendix B
- Sediment sampling – Appendix C
- Flow meter measurements – Appendix D.

The analytical laboratory will supply sample containers and preservatives, as well as coolers and packing material. Commercially available pre-cleaned jars will be used, and the laboratory will maintain a record of certification from the suppliers. The bottle shipment documentation will record batch numbers for the bottles. With this documentation, bottles can be traced to the supplier, and bottle wash analysis results can be reviewed. The bottle wash certificate documentation will be archived in the project file. Field personnel will not obstruct these stickers with sample labels.

Sample containers will be clearly labeled at the time of sampling. Labels will include the project name, sample location and number, sampler's initials, analysis to be performed, date, and time. The nomenclature used for designating field samples is described in Section 3.6.

3.3 EQUIPMENT DECONTAMINATION PROCEDURES

The following is a brief description of decontamination procedures for each set of equipment. Details of these procedures are described in Appendices A, B, and C.

3.3.1 Water Sampling Equipment

Any portion of the tubing, pump, filters, and ISCO sampler or other materials coming into contact with sampled stormwater will decontaminated prior to use or certified pre-cleaned from the equipment source. Appendices A and B contained detailed procedures and equipment material requirements to avoid potential contamination of samples.

[Additional summary level detail will be added to this section….]

3.3.2 Sediment Sampling Equipment

Sediment Traps. Any portion of the sediment trap bottle, sample collection, and homogenization equipment coming into contact with sediment samples will decontaminated prior to use or certified pre-cleaned from the equipment source. Detailed decomtamination procedures for sampling equipment are included in the Appendix C.

[Additional summary level detail will be added to this section….]

Water Filtering for Sediment Collection (Back up Procedure). Any portion of the tubing, pump, filters, or other materials coming into contact with sampled stormwater will decontaminated prior to use or certified pre-cleaned from the equipment source. Detailed decomtamination procedures for sampling equipment are included in Appendix C.

[Additional summary level detail will be added to this section….]

3.4 STORMWATER SAMPLE COLLECTION PROCEDURES

Stormwater collection procedures are described in detail in Appendices A and B. Two methods of stormwater collection will be used:

- Flow weighted composite sampling of organics, metals, and conventionals that will be collected using an automated ISCO pump and sample container system and Teflon™ tubing. (Appendix A)
- Grab water sampling of organics and conventionals using ISCO pump, sample containers, and Teflon tubing. (Appendix B)

The SOP for stormwater sampling follows the guidelines in EPA's Method 1669, *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (EPA 1996), and by the *Field Sampling Manual for the Regional Monitoring Program for Trace Substances* (David et al. 2001). Detailed procedures for each type of sample collection that follow these guidelines are described in Appendices A and B.

3.4.1 Summary of Composite Stormwater Sampling Methods

Stormwater samples for standard chemical and conventional analyses will be collected using a peristaltic pump with an extended sampling tube fixed at the desired location in the catch basin outlet. The pre-cleaned ISCO sampler will be delivered to the sample site by the sampling team. Where ever possible, the sampler will be located above ground and next to the catch basin or junction selected for sampling. The pick up screen and flow sensor will be installed on the sensor carrier that was installed when the sediment traps were installed. Although there are tools that allow surface installation of sensors, confined space entry may be required to install the pickup screen and flow sensor. If confined space entry is required, it shall be done in accordance with the procedures in the HSP (Appendix H). In addition, at some locations accessible to the public (e.g., manholes on streets) the actual sampler will be installed within the junction or catchbasin selected for sampling. This procedure will also have to follow Appendix H.

After the pickup and sensor have been installed, the sampler will be powered up and allowed to go through the self check process. If the sampler checks, the sample bottles will be installed using the CH-DH procedure. Once the bottle section of the sampler is closed the sampler will be enabled. The sampler will then be lowered into the catch basin, if necessary. Care will be taken not to pinch or kink the pick up tube of the flow sensor cable.

Once the sampler is deployed and the cover is closed, the sampling team leader, or designate, will call the sampler to disable it until an appropriate storm is forecasted. The automatic sampler, when enabled, will be programmed to initiate sampling once a specified trigger flow rate has been exceeded and will continue to sample until the flow rate decreases below the trigger level or the bottle capacity is reached. The trigger flow rate will likely be different for each sampling station as there may be base flow. The sampler will collect flow weighted samples into 4 one-gallon glass bottles. The sampler will collect 10 ml samples per specified volume of water that must be determined for each monitoring station.

After the sampling event, the sampling team leader will call the sampler and disable it to prevent additional stormwater from being collected if the flows increase. The sampling team will retrieve the automatic sampler and using CH/DH procedures remove sample bottles and seal them with Teflon lined caps, label and package them appropriately for transportation to the LWG Field Laboratory. The sampling team will install new bottles and re-deploy the sampler as described previously.

At the LWG Field Laboratory, the sampling team will be combine the samples into a single composite and samples will be filtered or otherwise prepared for laboratory analyses. The compositing and filtering will occur at the Field Laboratory as soon as possible after sample collection. The goal will be to conduct filtering within 24 hours of sample retrieval from the samplers. Field filtering procedures for metals are described in detail in Appendix A. Throughout this process, the samples shall be handled following the procedures described in the Chain of Custody SOP (Appendix F).

3.4.2 Summary of Grab Stormwater Sampling Methods

Stormwater grab samples for standard chemical and conventional analyses will be collected using a peristaltic pump that is part of the ISCO automatic sampler. The ISCO sampler will be removed from the catch basin by the sampling team. Using the CH/DH procedure the sampler case will be opened and the delivery tube will be removed from the bulk head fitting. A Teflon lined tube will be connected to the bulkhead fitting to collect the desired samples. The sampler will be put into “Grab” mode and the specified volume will be programmed into the sampler. Once activated, the sampler will purge and the grab sample will be collected.

The sampling team will seal, using CH/DH procedures, the samples with Teflon lined caps, label and package them appropriately for transportation to the LWG Field Laboratory. The sampling team will remove, using CH/DH procedures, the grab sampling tube from the bulkhead fitting and reconnect the distribution tube and close up the sampler. The sampling team will re-deploy the sampler as described previously.

At the LWG Filed Laboratory, the sampling team will combine the samples into a single composite for each event and samples will be filtered or otherwise prepared for laboratory analyses. The compositing and filtering will occur at the Field Laboratory as soon as possible after sample collection. The goal will be to conduct filtering within 24 hours of sample retrieval from the samplers. Field filtering procedures for organic compounds are described in detail in Appendix B. The samples shall be handled following the procedures described in the Chain of Custody SOP (Appendix F)

3.5 SEDIMENT SAMPLE COLLECTION PROCEDURES

Collection procedures for stormwater sediments are detailed in Appendix C and summarized below.

3.5.1 Sediment Traps

As described in Section 2.3, sediment traps will be deployed at each location for a minimum target period of three months. Sediment traps will be inspected at a minimum on a monthly basis. When inspected, if the collection bottle is half full, sediments will be collected and archived and a clean bottle, filled with DI water (to prevent floating) will be returned to the trap. This process will be repeated, and sampled sediments archived at the LWG Field Laboratory for additional later compositing until sufficient volume of sample is obtained for all analytes or the trap deployment period ends. If sufficient volume was obtained prior to the end of the deployment period, the procedure below will be followed at that time and the trap container redeployed. Sample obtained from the remainder of the deployment period will be handled per the procedures below, except in that case the step regarding compositing with the archives would be skipped.

Sediment samples will be capped with Teflon lined lids, labeled, sealed and packaged appropriately for transport to the LWG Field Laboratory. At the filed laboratory the samples will be stored in the refrigerator.

Once sufficient sample volume has been obtained or the deployment period has ended, all sampled sediments (including archives) will combined in one decontaminated stainless steel bowl using decontaminated stainless steel implements and thoroughly homogenized

To remove sediment from the sample bottles will require several steps as the bottle opening is approximately 1/2 inch in diameter. The sampling technician will decant most of the water from each sample bottle into a decontaminated flask. The technician will then swirl or stir, with a decontaminated stainless steel implement, the remaining water to mobilize the sediments. The technician will then pour the slurry into a decontaminated funnel with appropriate filter material and allow the leachate to drain to a decontaminated flask. Once the sediment has drained to the appropriate consistency the sample can be lifted out by the filter material and dumped into the decontaminated mixing bowl. The leachate water and the decanted water then can be used to rinse the sample bottle and remove the last of the sediments. Once all the sample bottles have been emptied and the sediments have been added to the mixing bowl, a stainless steal spoon can be used to scrape off any sediments that have adhered to the filter material into the mixing bowl. The leachate water or decanted water can be used to rinse the filter material or add moisture if needed to homogenize the sediments

Sample analysis containers will be filled in the priority order shown in Table 2-3, except for the alternate priority for some locations as described in Section 2.3, until the bowl is empty.

3.5.2 Water Filtering for Sediment Collection (Back up Procedure)

This procedure will be used in the event that a sediment trap cannot be deployed at a location because of limited space availability or other logistical reasons. To mimic the deployment of sediment traps, this procedure could be employed over several storm events at the location in question. The results over several events could then be "composited' on paper to mimic the deployment of a sediment trap over 3 months. This would require greater number of sample analyses than currently budgeted for sediment trap analyses.

Large volumes of water will be pumped through Teflon™ tubing to collect the particulate fraction from the water for subsequent analysis of the particulate fraction. Currently, two techniques are being evaluated as options for sediment collection: collection with a portable continuous flow centrifuge pump; and collection with a peristaltic pump system with sequential filters and glass fiber filter cartridges. The total volume of water pumped for each sample will be determined based on the analytes selected for the station. Table 3-1 provides estimates of stormwater sample volumes required for each of these sample collection techniques

The portable continuous flow centrifuge pump system samples would be collected by pumping water from the sample location (catchbasin or junction) and sequestering the suspended particles in sample collection jar, which would avoid collecting and retaining large volumes of water for subsequent filtration. The accumulated sediment would then be transferred from the centrifuge pump sample collection vessel into sample jars for chemical analysis. The peristaltic pump system would require a high pressure tubing setup and large volume capacity filters, in series, to extract the suspended particles. The large capacity filters would be connected in series with the smallest pore size of 4 or 5 um, which is the low-end range for silt particles (ASTM 1985). The peristaltic system could be conducted by collection of water into a container (e.g., 20L carboy) and subsequent filtration. The reconnaissance survey will help determine whether the high-volume collection could be conducted directly from the outfall without intermediate storage. The minimum filter pore size to be used will be 4-5 µm.

Samples will be collected using the "clean hand – dirty hand" method. Once the desired volume is pumped, the glass fiber filters will be removed, placed in sample jars, and stored in a cooler containing wet ice. At the analytical laboratory, the filters will be analyzed to determine the concentration of chemicals present within the collected particulates. Detailed procedures for this sampling technique are described in Appendix C [to be written once method is finalized].

3.6 SAMPLE IDENTIFICATION

A unique code will be assigned to each sample as part of the data record. This code will indicate the project phase, sampling location, sample type, sampling event, and level of replication/duplication. All samples will be assigned a unique identification number based on a sample designation scheme designed to meet the needs of the field personnel, laboratory and LWG data management, validation chemists, and data users. Sample identifiers will consist of two to three components separated by dashes. The first component, LW2, identifies the data as belonging to the Lower Willamette River RI/FS. The second component will begin with the abbreviation "STW" to designate the stormwater sample, followed by a single-number code that designates the sampling event. The station number will complete the second component.

Additional codes may be adopted, if necessary, to reflect sampling equipment requirements. Leading zeros will be used for stations with numbers below 100 for ease of data management and correct sorting. The third component will be used to code field duplicate samples and splits. A single digit number will be used to indicate field duplicates or splits in the third component of the sample identifiers. For equipment decontamination blanks, sequential numbers starting at 900 will be assigned instead of station numbers. The sample type code will correspond to the sample type for which the decontamination blank was collected.

Example sample identifiers are:

- LW2-STW1022: stormwater sample from Station 22 collected during the first sampling event.
- LW2-SW1022-1: stormwater sample from Station 22 collected during the first sampling event; field duplicates or splits are associated with this sample.
- LW2-SW1022-2: duplicate or split stormwater sample from Station 22 collected during first sampling event.

3.7 SAMPLE HANDLING AND STORAGE

The number, size, and type of sample containers needed for each sample are listed in Table 3-2 [to be completed]. This table also includes the preservative and holding times for the various analyses. In general, preservatives will be added to the sample containers by the analytical laboratory prior to shipment to the field. The sampling team will confirm the presence or absence of preservative in the containers prior to filling. Any discrepancies with preservatives will be noted on the field sampling records, and corrective action will be initiated.

Once the sample is collected and preserved using the CH/DH technique, the sample container will be capped, labeled, and placed in double-sealed polyethylene bags and stored on ice or refrigerated until shipped to the laboratory under the chain of custody procedures outlined in Appendix F

Each storage freezer or refrigeration unit in the LWG Field Laboratory will be monitored daily to ensure temperature compliance. Each unit will have a separate log form containing date, time, and temperature information.

3.8 QA/QC

Field QC samples are used to assess sample variability (e.g., replicates), evaluate potential sources of contamination (e.g., rinsate, decontaminate, and trip blanks), or confirm proper storage conditions (e.g., temperature blanks). The estimated numbers of field and QC samples are listed in Table 2-2. Details on field replicate samples and field QC samples are described in the QAPP Addendum in Appendix H.

In summary, the QAPP Addendum describes quality assurance/quality control (QA/QC) procedures that will be used to complete the storm water investigation. The QAPP Addendum for the storm water investigation was developed within the framework of the existing LWG Round 2 QAPP (Integral and Windward 2004) and Addenda (Integral 2004a) for the on-going LWG investigations.

For sediment trap samples, the mass of material collected is anticipated to be limited. For sediment samples, the QAPP Addendum includes the collection of field QC samples and additional mass for laboratory QC samples (matrix spike, matrix spike duplicate or laboratory duplicate) as follows and per Table 2-2:

- Field replicate, 1 per 20 samples
- Laboratory QC samples, 1 per 20 samples
- Equipment rinsate blank for phthalates, 1 per 20 samples.

Field replicates will be generated by deploying sediment traps with additional sample collection vessels, and compositing the sediment from each half of the sediment trap collection vessels, separately, into two subsamples for analysis. Analysis for laboratory QC samples will be conducted by dividing the total sediment collected into 3 aliquots of equal mass for the laboratory analysis of the sample, matrix spike, and matrix spike duplicate.

For water samples, the sampling program will be designed to collect additional volume for field and laboratory QC samples. The QC program for water samples includes:

- Field replicates, 1 per 20 samples
- Laboratory QC samples, 1 per 20 samples
- Equipment rinsate blank for all analyte groups, 1 per 20 samples.

The inclusion of phthalates in the analyte list requires careful consideration in the design of the sample collection program to ensure that the sediment and water samples do not come into contact with phthalate-containing material. Because the water samples require pumping and additional handling for compositing, the likelihood of field contamination from contact with phthalate-containing components increases and could result in qualification of the data if phthalates are detected in the associated field blank samples. The procedures detailed in Appendices A, B, and C include careful consideration of the materials and handling procedures used in order to avoid such sampling contamination if at all possible.

4.0 SAMPLING IMPLEMENTATION AND SCHEDULE

4.1 SAMPLING TEAMS AND ORGANIZATION

In order to implement the stormwater sampling program a team approach has been developed to prepare the FSP, install and maintain sampling equipment, collect samples and deliver them to the laboratory, and finally report the data. As shown on the organization chart (Figure 4-1) Anchor has the lead role in implementing the FSP. The following discussion briefly outlines the duties of the key participants:

Mr. Stivers will act as the overall Anchor project manager. As the manager he will act as the key contact to the Portland Harbor technical and management teams. In addition, Mr. Stivers played a key role in the development of the monitoring strategies, selection of monitoring sites, identifying the constituents to be monitored, and ensuring the FSP meets the overall study objectives noted in Section 1.

Mr. Page is over seeing and is the lead author of the FSP. He will participate in the station reconnaissance and preparation, described in the following section. He will direct the sampling teams when to activate the automatic samplers, equipment installation, assist in troubleshooting equipment problems, and be available to act as an alternate on the sampling teams.

The sampling teams will be lead by an Anchor water quality specialist familiar with the equipment operation. Each team will also have a specialist from Integral to oversee the collection, processing, and shipment of the samples to the laboratory. The team leader will have the responsibility to deploy and redeploy their automatic samplers as needed, activate their automatic samplers when notified of a storm meeting the sampling criteria is imminent, conduct collection the samples in a timely manner, conduct or coordinate delivery of the samples to the LWG Field Laboratory, coordinate delivery of samples to the analytical laboratories, filling out all field forms and chain of custody forms, and ensure that all field work is conducted in accordance to the HSP (Appendix I).

The O&M Team will be based in Portland and have responsibility to routinely inspect and repair the sediment traps, ISCO samplers, and other equipment, download the data loggers, and rotate the batteries in the automatic samplers to ensure that they are ready at all times to initiate sampling. They may also deliver samples to the LWG Field Laboratory as needed.

The Field Laboratory Team will assist in the processing, tracking, and archiving of samples, maintain sample archives, conduct packing of coolers and filling out chain of custody forms for laboratory delivery, will coordinate with the laboratories for sample delivery and/or pickup, facilitate the tracking of samples, and coordinate with laboratories to ensure correct analyses following the QAPP addendum are conducted.

The laboratories used for the sampling program are listed in Table 2-4. The Laboratories will be responsible for providing "certified clean" sample bottles and equipment to the sampling teams, coolers and packaging materials, labels, seals, and chain of custody forms. The laboratories will designate a project coordinator that will be responsible for receiving the samples from the field laboratory team. The laboratory coordinator will also be responsible to ensure that the samples are analyzed according to the specified methodologies

4.2 STATION RECONNAISSANCE AND PREPARATION

Sample locations will be verified during a reconnaissance visit consisting of the sampling team leader for those sample locations and persons knowledgeable with the particular location in question. Conditions encountered in the field during implementation of this plan may result in modifications to the sampling design at some or all locations. The Stormwater Technical Team will be made aware of the conditions and will approve the modifications of the plan.

During the reconnaissance survey, the teams will identify the targeted discharge point and inspect the site to identify the location where the equipment can be installed. At each site the team will locate the catch basin or structure nearest the outfall where the equipment may be installed. At these locations, the team will:

- attempt to determine whether the river back up is likely (determine site elevation from site map, measure down to invert of structure outlet, compare invert elevation to MHHW or specified elevation (Figure 4-2);
- verify that there is space available within or adjacent to the site for the ISCO automatic sampler;
- verify that there is space available to install the sediment trap; and
- measure outlet pipe size to order or fabricate the appropriate mounting brackets for the sampler pick up tube, flow meter sensor and the sediment trap.

A key measurement that will be needed is the depth of the structure below the invert of the outlet. The sediment traps need to be mounted adjacent to the outlet with the opening of the sampling bottle at the same elevation of the invert. If the bottle is located higher it may not effectively collect the heavier fractions of the sediment or may introduce excessive turbulence that interferes with the function of the flow meter.

In addition, the team will attempt to identify any non-stormwater flows that could enter the conveyance during the sampling period (e.g., groundwater, sheet flow from adjacent sites, batch discharges). Depending on the source, the sample plan may need to include collection of information on the nature, amount and timing of those flows.

If space is not adequate to install the equipment, the team will move upstream to the next available structure for evaluation. Anchor will report the identified sampling locations to the Stormwater Technical Team for approval. It is possible that a suitable monitoring station cannot be found and an alternative outfall will be needed to be selected to meet the study goals, see Section 4.3 for a discussion of the contingency process for selecting and alternative sampling location

4.3 BACKUP AND CONTINGENCY PROCESS FOR LOCATION SELECTION AND SAMPLING

If it is determined that a sediment trap or automated water sampler deployment is infeasible for the selected outfall location, several alternatives may be implemented:

4.3.1 Land Use Based Sampling Sites

If it is a land use based sampling site, another representative outfall or basin could be selected; alternately another location within the basin could be selected, as long as the remaining basin area is still representative of that land use. Based on the identification of a physically suitable site by the reconnaissance team, as described previously, the site will be re-evaluated in the office. The selected location will be first compared to the infrastructure maps to determine what areas will be captured by the sampling location. The land uses in the captured area will be evaluated to determine if they meet the sampling goal.

If the revised basin doesn't meet the land use selection criteria an alternative outfall will be selected and a reconnaissance survey will be conducted to determine if the equipment can be installed.

Time is of the essence to collect the stormwater samples in the 2006/2007 rainy season. From that perspective, selecting a truncated area of the original basin would be superior if the remaining area provided the land use characteristics desired. Deciding to look for an alternative basin and investigating it may result in not getting the desired number of water quality samples or the desired volume of sediment. However, because all the equipment will not be delivered and installed simultaneously there may be a two-week period during which an alternative site can be selected and approved of by the Stormwater Technical Team without greatly affecting the implementation of the FSP.

If the primary issue is that a sediment trap cannot be installed, the high volume water filtering alternate technique could be employed at these sites without need for moving to alternate locations.

4.3.2 Industrial Sampling Sites

If it is not feasible to install the sampling equipment at an Industrial sampling site, the same procedure described above for Land Use Based sites would be employed by moving up the pipe to see if another sampling point that drains most of the desired site can be found. If such an on-site alternate location cannot be found, it may or may not be feasible to select another industrial site to fulfill the role of the desired site. Any such proposals to move sites would be closely coordinated with the Stormwater Technical Team to obtain approval.

It is difficult to speculate what problems may occur and what the solutions may be without the basic reconnaissance of the sites completed. Consequently, we do not attempt to discuss alternate procedures for all potential situations. In general, if an ISCO sampler cannot be installed for any reason and selection of an alternate site is not acceptable, the alternate approach of manually collecting discrete or manual composites could be considered. If a sediment trap cannot be installed, high volume filtered sampling could be conducted.

4.3.3 Inadequate Sediment Collection

The sediment generation rate varies by land use, topography, implementation of BMPs, and rainfall intensity. A well swept, nearly level, industrial area may not generate a significant quantity of sediment. Low intensity storms may not detach and mobilize sediments. Consequently, if the collection bottle is less than one-third full at the first monthly inspection, the rainfall records will be evaluated to determine if there were storms likely to generate runoff, the sampler will be inspected to ensure that it was installed properly, the catch basin will be inspected to see if it is accumulating sediment, the contributing basin will be visually surveyed to see if sediment is available to wash off. Based on the findings, it may be recommended that the sediment trap be repositioned or relocated to obtain better collection rate, additional bottles deployed, or that another sampling method be employed. An alternative sediment sampling method would be high volume filtered samples.

4.4 SITE SPECIFIC SAMPLING ADDENDA

A site specific addendum will be added to this FSP once the field reconnaissance survey has been completed and the equipment has been installed. A description of each sampling site will be developed that describes the specific details for implementation of this FSP at the each site. The specific details will include:

1. Figure showing the actual sampling location with in the basin.

2. The reconnaissance survey datasheets, notes, and photographs as necessary to describe the situation.

3. Diagram of sample equipment set up within the specific site pipe, catch basin, or junction noting key dimensions.

4. Photographs of the installation.

5. Calculations of runoff quantity for various ranges of storms for sampler programming.

6. Key parameters for sampler programming (i.e. number and size of bottles, sampling rate for various storm totals, enabling flow rate, length of pickup tube, etc.).

7. Sample team Leader responsible for sampler.

8. Sampler telephone number.

9. Any site specific considerations that will result in deviations from the FSP standard procedures.

10. Descriptions of any planned deviations from detailed procedures in this FSP including appendices that will be applied to this site.

11. Alternate or contingency procedures (as discussed above) that are proposed for that site.

4.5 PROJECT SCHEDULE

The actual start dates for the sampling will be determined following EPA approval of this Stormwater FSP. Other conditions that may affect the sampling schedule are weather and equipment conditions and availability. Currently, it is anticipated that the stormwater and sediment samples will be begin to be collected in late February through early March. Figure 4-3 shows the currently projected schedule. The most critical item beyond EPA approval is the acquisition and deployment of the water samplers. There is a 3 to 6 week lead time to acquire all the equipment. It is anticipated that each sampling crew will be able to install two sampling kits per day. Consequently, it will take approximately 4 to 7 weeks to deploy the first sampler from the time that it is ordered and approximately 8 weeks from the time the samplers are ordered for all of them to be deployed.

The automated samplers will be activated as soon as they are installed to record flow rates and will be enabled to collect samples during the first storm event that exceeds the predetermined precipitation conditions. The sediment traps will also begin functioning as soon as they are installed. While flow is present in the stormwater system the samplers will be trapping sediments. Based on the weather forecasts and anticipated precipitation, sampling teams will be notified to enable the samplers and deployed to collect samples during following the storm events. Additionally the sampling teams will be deployed based on forecasted weather to collect grab samples from selected locations.

5.0 REPORTING

5.1 LABORATORY AND CHEMICAL DATA

Validated analytical laboratory data will be provided to EPA in an electronic format within 90 days of completion of each sampling event. A sampling event will generally be considered complete when the last sample of that type described in this FSP has been collected.

5.2 REPORTING

A field sampling report will be prepared and submitted to EPA within 60 days of completing all stormwater and sediment field sample collection efforts as described in this FSP. The field sampling report will summarize field sampling activities, including sampling locations (maps), requested sample analyses, sample collection methods, and any deviations from the FSP.

Stormwater and sediment chemistry results will be reported in tabular format in a Stormwater Site Characterization Summary Report that will be submitted to EPA within 120 days of completing sampling and analysis for all stormwater activities. Stormwater and other information and data evaluations also will be included in the Stormwater Site Characterization Summary Report.

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